

We claim:

1. A system for performing device detection and service discovery in a mobile ad hoc communications network, comprising:
  - a memory device; and
  - 5 a processor disposed in communication with the memory device, the processor configured to:
    - conduct an inquiry of the mobile ad hoc communications network to discover at least one nearby device, the inquiry including an indication that said at least one nearby device may include a middleware layer;
    - 10 when the inquiry includes the indication that said at least one nearby device may include the middleware layer:
      - create a connection to said at least one nearby device;
      - confirm whether said at least one nearby device includes the middleware layer; and
    - 15 when said at least one nearby device includes the middleware layer:
      - execute the middleware layer to perform application and service discovery.
2. The system of claim 1, wherein the middleware layer includes a service discovery protocol and at least one computer program, each computer program comprising at least one sequence of operational instructions.

3. The system of claim 1, wherein when said at least one nearby device includes the middleware layer, the processor is further configured to:

execute the middleware layer to launch applications and services.

5 4. The system of claim 1, wherein to conduct the inquiry, the processor is further configured to:

send an inquiry request message to a coverage area within the mobile ad hoc communications network; and

receive an inquiry response message from said at least one nearby device, the inquiry response message including the indication.

10 5. The system of claim 4, wherein the inquiry request message is a Bluetooth inquiry command, and the inquiry response message is a Bluetooth inquiry result command.

15 6. The system of claim 5, wherein setting at least one bit in the Bluetooth inquiry result command to at least one predetermined value is the indication.

7. The system of claim 6, wherein said at least one bit includes at least one of the ad hoc networking aware bit, the location information bit, or the telephony capable bit.

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8. The system of claim 5, wherein setting at least two bits in the Bluetooth inquiry result command to at least one predetermined value is the indication.

9. The system of claim 8, wherein said at least two bits includes at least two of the ad hoc networking aware bit, the location information bit, or the telephony capable bit.

5 10. The system of claim 8, wherein said at least two bits includes the ad hoc networking aware bit, and at least one of the location information bit, or the telephony capable bit.

11. The system of claim 1, wherein to create the connection, the processor is further configured to:

10 send a paging request message to a coverage area within the mobile ad hoc communications network directed to said at least one nearby device; and receive a paging accept message from said at least one nearby device.

12. The system of claim 1, wherein to confirm that said at least one nearby device includes the 15 middleware layer, the processor is further configured to:

send a recognition request message to said at least one nearby device; and receive a recognition response message from said at least one nearby device.

13. The system of claim 12, wherein receipt of the recognition response message confirms that 20 said at least one nearby device includes the middleware layer.

14. The system of claim 12, wherein the recognition response message includes a confirmation

that said at least one nearby device includes the middleware layer.

15. The system of claim 14, wherein setting at least one bit in the recognition response message to at least one predetermined value is the confirmation.

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16. The system of claim 12, wherein the recognition request message is a Bluetooth Service Discovery Protocol request and the recognition response message is a Bluetooth Service Discovery Protocol response.

10 17. The system of claim 1, wherein to execute the middleware layer to perform application and service discovery, the processor is further configured to:

receive a notification message from said at least one nearby device, the notification message including a local application directory stored in said at least one nearby device;  
store an update to a combined application directory, the update based on a comparison of the local application directory and the combined application directory; and  
send an update message to said at least one nearby device, the update message including an update portion of the combined application directory for updating the local application directory stored in said at least one nearby device.

15 18. The system of claim 17, wherein the processor is further configured to:

launch a local application based on a reference in the combined application directory; and  
connect the local application to a counterpart application executing on said at least one

nearby device.

19. A method for performing device detection and service discovery in a mobile ad hoc communications network, comprising:

5           conducting an inquiry of the mobile ad hoc communications network to discover at least one nearby device, the inquiry including an indication that said at least one nearby device may include a middleware layer;

when the inquiry includes the indication that said at least one nearby device may include the middleware layer:

10           creating a connection to said at least one nearby device;

              confirming whether said at least one nearby device includes the middleware layer;

              and

              when said at least one nearby device includes the middleware layer:

              executing the middleware layer to perform application and service discovery.

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20. The method of claim 19, wherein the middleware layer includes a service discovery protocol and at least one computer program, each computer program comprising at least one sequence of operational instructions.

20           21. The method of claim 19, wherein when said at least one nearby device includes the middleware layer, the method further comprises:

              executing the middleware layer to launch applications and services.

22. The method of claim 19, wherein the conducting of the inquiry further comprises:  
sending an inquiry request message to a coverage area within the mobile ad hoc  
communications network; and  
5 receiving an inquiry response message from said at least one nearby device, the inquiry  
response message including the indication.

23. The method of claim 22, wherein the inquiry request message is a Bluetooth inquiry  
command, and the inquiry response message is a Bluetooth inquiry result command.

10 24. The method of claim 23, wherein setting at least one bit in the Bluetooth inquiry result  
command to at least one predetermined value is the indication.

15 25. The method of claim 24, wherein said at least one bit includes at least one of the ad hoc  
networking aware bit, the location information bit, or the telephony capable bit.

26. The method of claim 23, wherein setting at least two bits in the Bluetooth inquiry result  
command to at least one predetermined value is the indication.

20 27. The method of claim 26, wherein said at least two bits includes at least two of the ad hoc  
networking aware bit, the location information bit, or the telephony capable bit.

28. The method of claim 26, wherein said at least two bits includes the ad hoc networking aware bit, and at least one of the location information bit, or the telephony capable bit.

29. The method of claim 19, wherein the creating of the connection further comprises:

5 sending a paging request message to a coverage area within the mobile ad hoc communications network directed to said at least one nearby device; and receiving a paging accept message from said at least one nearby device.

30. The method of claim 19, wherein the confirming further comprises:

10 sending a recognition request message to said at least one nearby device; and receiving a recognition response message from said at least one nearby device,

31. The method of claim 30, wherein the receiving of the recognition response message

confirms that said at least one nearby device includes the middleware layer.

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32. The method of claim 30, wherein the recognition response message includes a confirmation that said at least one nearby device includes the middleware layer.

20 33. The method of claim 32, wherein setting at least one bit in the recognition response message to at least one predetermined value is the confirmation.

34. The method of claim 30, wherein the recognition request message is a Bluetooth Service

Discovery Protocol request and the recognition response message is a Bluetooth Service Discovery Protocol response.

35. The method of claim 19, wherein the executing of the middleware layer to perform  
5 application and service discovery further comprises:

receiving a notification message from said at least one nearby device, the notification message including a local application directory stored in said at least one nearby device;

10 storing an update to a combined application directory, the update based on a comparison of the local application directory and the combined application directory; and sending an update message to said at least one nearby device, the update message including an update portion of the combined application directory for updating the local application directory stored in said at least one nearby device.

15 36. The method of claim 35, further comprising:

launching a local application based on a reference in the combined application directory;

and

connecting the local application to a counterpart application executing on said at least one nearby device.

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37. A computer program product for performing device detection and service discovery in a mobile ad hoc communications network, comprising:

a computer readable medium storing:

program code for conducting an inquiry of the mobile ad hoc communications network to discover at least one nearby device, the inquiry including an indication that said at least one nearby device may include a middleware layer;

5 program code for creating a connection to said at least one nearby device when the inquiry includes the indication that said at least one nearby device may include the middleware layer;

10 program code for confirming whether said at least one nearby device includes the middleware layer when the inquiry includes the indication that said at least one nearby device may include the middleware layer; and

15 program code for executing the middleware layer to perform application and service discovery when said at least one nearby device includes the middleware layer.

38. The computer program product of claim 37, wherein the middleware layer includes a service discovery protocol and at least one computer program, each computer program comprising at least one sequence of operational instructions.

20 39. The computer program product of claim 37, the computer readable medium further storing:  
program code for executing the middleware layer to launch applications and services when  
said at least one nearby device includes the middleware layer.

40. The computer program product of claim 37, wherein the program code for conducting the inquiry further comprises:

program code for sending an inquiry request message to a coverage area within the mobile  
5 ad hoc communications network; and  
program code for receiving an inquiry response message from said at least one nearby  
device, the inquiry response message including the indication.

41. The computer program product of claim 37, wherein the program code for creating the  
10 connection further comprises:

program code for sending a paging request message to a coverage area within the mobile ad  
hoc communications network directed to said at least one nearby device; and  
program code for receiving a paging accept message from said at least one nearby device.

15 42. The computer program product of claim 37, wherein the program code for confirming that  
said at least one nearby device includes the middleware layer further comprises:

program code for sending a recognition request message to said at least one nearby device;  
and  
program code for receiving a recognition response message from said at least one nearby  
20 device,

43. The computer program product of claim 37, wherein the program code for executing the

middleware layer to perform application and service discovery further comprises:

program code for receiving a notification message from said at least one nearby device, the notification message including a local application directory stored in said at least one nearby device;

5 program code for storing an update to a combined application directory, the update based on a comparison of the local application directory and the combined application directory; and

10 program code for sending an update message to said at least one nearby device, the update message including an update portion of the combined application directory for updating the local application directory stored in said at least one nearby device.

44. The computer program product of claim 43, wherein the program code for executing the middleware layer to perform application and service discovery further comprises:

15 program code for launching a local application based on a reference in the combined application directory; and  
program code for connecting the local application to a counterpart application executing on said at least one nearby device.

45. A system for performing device detection and service discovery in a mobile ad hoc  
20 communications network, comprising:  
means for conducting an inquiry of the mobile ad hoc communications network to discover at least one nearby device, the inquiry including an indication that said at least one

nearby device may include a middleware layer;  
means for creating a connection to said at least one nearby device when the inquiry includes  
the indication that said at least one nearby device may include the middleware layer;  
means for confirming that said at least one nearby device includes the middleware layer  
5 when the inquiry includes the indication that said at least one nearby device may  
include the middleware layer; and  
means for executing the middleware layer to perform application and service discovery  
when said at least one nearby device includes the middleware layer.

10 46. The system of claim 45, wherein the middleware layer includes a service discovery protocol  
and at least one computer program, each computer program comprising at least one sequence of  
operational instructions.

15 47. The system of claim 45, further comprising:  
means for executing the middleware layer to launch applications and services when said at  
least one nearby device includes the middleware layer.

20 48. The system of claim 45, wherein the means for conducting the inquiry further comprises:  
means for sending an inquiry request message to a coverage area within the mobile ad hoc  
communications network; and  
means for receiving an inquiry response message from said at least one nearby device, the  
inquiry response message including the indication.

49. The system of claim 45, wherein the means for creating the connection further comprises:  
means for sending a paging request message to a coverage area within the mobile ad hoc  
communications network directed to said at least one nearby device; and  
5 means for receiving a paging accept message from said at least one nearby device.

50. The system of claim 45, wherein the means for confirming that said at least one nearby  
device includes the middleware layer further comprises:

means for sending a recognition request message to said at least one nearby device; and  
10 means for receiving a recognition response message from said at least one nearby device,

51. The system of claim 45, wherein the means for executing the middleware layer to perform  
application and service discovery further comprises:

means for receiving a notification message from said at least one nearby device, the  
15 notification message including a local application directory stored in said at least one  
nearby device;

means for storing an update to a combined application directory, the update based on a  
comparison of the local application directory and the combined application  
directory; and

20 means for sending an update message to said at least one nearby device, the update message  
including an update portion of the combined application directory for updating the  
local application directory stored in said at least one nearby device.

52. The system of claim 51, wherein the means for executing the middleware layer to perform application and service discovery further comprises:

means for launching a local application based on a reference in the combined application

5 directory; and

means for connecting the local application to a counterpart application executing on said at least one nearby device.